Student dropout in higher education as perceived by university students

Sussy Bayona-Oré

Autonomous University of Perú
Lima, Perú

ABSTRACT: Student dropout is a significant and global concern for higher education institutions. In academic organisations, there is presently a duality between retention and dropout. This situation harms not only the student who sees their dreams cut short but also the educational organisations and society more widely. Several studies have argued that technological, environmental, academic, economic, organisational and other factors contribute to student dropout. This study aims to identify the critical elements that condition student dropout. The methodology used is quantitative. A questionnaire was developed and applied on-line. The study population comprised 91 systems engineering students. Results show that according to the students' perceptions, aspects influencing student dropout include tuition fees payment, effects of Covid-19, parents' recommendation to pursue a professional career, economic commitment, unplanned pregnancy and loss of financial support from a family member. Another factor that had not been considered in years prior to the Covid-19 pandemic is technology, especially related to infrastructure and digital competencies.

INTRODUCTION

University student dropout is a problem affecting universities worldwide [1][2] and harming both families and society [3-5]. For many students, entering university life is a new experience that generates myriad expectations for them and their families, and effectuates significant changes in the teaching and learning process [6] toward responsibility, independence, the ability to relate to new people and maturity [7]. In this new educational process, which is already conditioned by the differences in curricular content, the deepening gap in subjects offered by public and private schools, and the disparities that exist between those coming from big cities and distant towns, students may present difficulties for various reasons and end up abandoning their studies. Having a good level of preparation prior to entering university is ideal for doing well in higher education [8] and student background characteristics are determinants of student dropout [9].

There is no single definition for student dropout. According to Ashour, it refers *…to a student who leaves the university course they are enrolled on before attaining their degree qualification* [4]. For Acevedo dropout is related to interruption of studies [10]. Additionally, student dropout can be defined as a student's decision to abandon the programme they entered [11]. Tinto argued that desertion is a process of interaction between a student's academic and social integration with objectives of personal and institutional commitment that ultimately determines the student's decision to drop out [12].

Also, student dropout is an indicator that is considered in the accreditation processes of university careers [13] because it has not only an individual impact (i.e. on the student) but also social and economic impacts [14]. Due to the fact that student dropout is conditioned by different factors, it has been recognised as a complex phenomenon [15]. Consequently, increasing scholarly interest has been placed on the factors conditioning dropout in special social aspects [16]. A suitable means of preventing dropout is to identify the factors that condition it and predict the rate. Several techniques, such as data mining and machine learning, have been proposed for this purpose [17].

A problem presented by students in the first cycle is the adaptation to the university system since it constitutes a change that they do not yet know how to manage. In some cases, these students may present low academic performance or ultimately drop out [15], thereby delaying the fulfilment of personal and family goals, which is exacerbated when the student does not assume responsibility. Students who present few failures at the beginning of the programme will remain regular in the programme [5]. It is, of course, necessary to differentiate between two types of desertion: voluntary, when the student voluntarily leaves their academic career, and involuntary, when the decision is institutional either because of performance or discipline [4].

The causes of student dropout are diverse and have long been the topic of scholarly attention. Scholars have proposed several factors that condition student dropout [18] and the academic failure of young people in universities. The categories proposed include technological, organisational [9][19-21], as organisational characteristics or infrastructure, economic

[21][22], academic [21][22] as academic performance or academic quality, personal aspects [21], among others. All factors that contribute to student permanence, and thus limit student dropout have also been discussed [21]. Vocational and economic factors, meanwhile, are the most relevant factors that affect university dropout [22].

The purpose of this article is to determine the most relevant critical factors in student dropout according to the students' perception. Highlighting the factors that condition dropout is useful in supporting decision making and implementing policies to reduce the impact of this problem in society [23]. Indeed, since determining the critical elements leading to student dropout is a challenge for universities, identifying them will allow these organisations to develop strategies aimed at reducing dropout, thus benefiting educational institutions, professionals and specialists in the area. These determinants have been long debated by researchers and, especially, by people in charge of establishing educational and institutional policies [24]. This research, therefore, aims to determine the causes or factors associated with dropout according to the perception of university students. The results of this research will be valuable for researchers, educational organisations, professionals, specialists in the area and educators to establish actions to minimise student dropout rates.

METHODS AND MATERIALS

This research analyses the factors that condition student dropout according to the perception of undergraduate students. The study applied a quantitative approach to measure the variables, and it is descriptive because it describes how the research problem manifests itself. The research design is non-experimental and cross-sectional since the data were collected in a unique period. This research was conducted in a Peruvian university during the 2020 academic year. The population comprised software engineering students. The sample was non-probabilistic, and a total of 91 students participated in the survey. The majority of the students were male (64.8%); 47.3% were under 21, and 52.7% were over 21. In terms of employment status, 58.2% of the participants were employed.

An instrument comprising 36 questions and distributed in three modules was adapted from Alban [25]. The questionnaire was created on-line using Google Forms and distributed via e-mail since face-to-face classes were suspended in the university centres due to Covid-19. For each of the questionnaire questions, corresponding to Part 2 and Part 3, a Likert scale was used with the following values: *never* - 1, *seldom* - 2, *sometimes* - 3, *most of the time* - 4 and *all the time* - 5. Table 1 presents the items according to the categories considered. Spreadsheets were used for data collection, and an Excel sheet was subsequently generated with the students' answers. Data analysis was performed using SPSS statistical software. Descriptive statistics, such as frequencies and means, were used to explain the results.

Table 1: Factors considered in the instrument.

Categories	Technological factors (4)	Environmental factors (4)	Academic factors (4)	Personal factors (5)	Economic factors (4)	Organisational factors (3)	Dropout intention (2)
Factors	Internet use	University categorisation	Teaching commitment	Low expectation	Economic commitment	University location	Satisfies expectations
	Social network	University ranking	Teachers do not enhance	Parents' recommendations	Programme price	Awarding of scholarships	Interest in completing the career
	Use of technology	Covid-19 effects	Conflicts between teachers and students	Unplanned pregnancy	Financial support	Research culture	
	Knowledge of technology	Covid-19 affected	Methodology adaptation	Lack of family support	Tuition payments		
				Lack of integration			

RESULTS

The results correspond to 91 students, of which 59 (64.8%) were male and 32 (35.2%) were female. Table 2 shows the frequency of participant characteristics. As shown in Table 2, 27.5% of the participants' fathers and mothers achieved the highest educational level. When analysing the secondary level of education, meanwhile, it is observed that the percentage of the father (47.3%) is higher than that of the mother (37.4%). The following sections describe the survey results related to technological factors, environmental factors, academic factors, personal factors, economic factors, organisational factors, and student dropout.

Table 2: Participant characteristics.

Aspects	Frequency	Percentage %
Age		
<= 21 years old	43	47.3%
> 21 years old	48	52.7%

Gender		
Male	59	64.8%
Female	32	35.2%
Work condition		
Work	53	58.2%
Do not work	38	41.8%
Level of father's educational		
Primary	10	10.9%
Secondary	43	47.3%
Technical	13	14.3%
Superior	25	27.5%
Level of mother's educational level		
Primary	18	19.8%
Secondary	34	37.4%
Technical	14	15.4%
Superior	25	27.5%

Technological Factors

Students were asked to consider the phenomenon whereby addiction to using the Internet for non-academic purposes can influence student dropout. In response to the question, 36.3% of the students argued that, in general, non-academic Internet use influences student dropout, while 23.1% of the students argued *all the time*. Social networks are a means of communication for different purposes; however, addiction to these social networks has been reported as a factor that influences student dropout. Nonetheless, results show that when asked to consider whether social media usage influences student dropout, 26.4% of the participants answered *all the time*, 29.7% answered *most of the time* and 25.3% answered *sometimes*. Meanwhile, when asked about the addiction to the use of technology (computers, cell phones) for non-academic purposes and their influence on student dropout, 15.4% of the participants answered *all the time*, while 33.0% agreed that this occurs *most of the time*.

These results can be explained by the fact that in the current context, networks have become a means of communication for students; they are also used for academic purposes, as well as for communicating with their families, accessing services, making on-line transactions, etc. Regarding limited knowledge of technology influence in the intention to dropout, 22% of the participants answered *all the time*, 36.3% answered *most of the time*, while 26.4% answered *sometimes*, which is perhaps a reflection of the shift from face-to-face to virtual education. In this context, digital competencies have improved in both teachers and students of all ages. Table 3 shows the results for the items considered in the questions concerning technological factors.

Table 3: Frequency (f) of questions related to technological factors.

Question	Never		Seldom		Sometimes		Most of the time		All the time	
	f	%	f	%	f	%	f	%	f	%
Addiction to use of the Internet	2	2.2	5	5.5	30	33.0	33	36.3	21	23.1
Addiction to social networks	6	6.6	11	12.1	23	25.3	27	29.7	24	26.4
Addiction to technology	2	2.2	13	14.3	32	35.2	30	33.0	14	15.4
Limited knowledge of technology	3	3.3	11	12.1	24	26.4	33	36.3	20	22.0

Environmental Factors

Environmental factors can influence student dropout. Among these factors one can mention the categorisation and ranking of universities and the pandemic due to Covid-19 that had an impact on students in 2019-2021 period. The results shows that 40.7% of the participants consider that categorisation of universities influences student dropout, 31.9% consider that ranking of universities influences student dropout. In both cases, students assigned a score greater than or equal to four. When students were asked to answer the question …*Has Covid-19 affected the possibility of continuing your studies?*, it was found that nearly 50% of the students (23.1% and 25.3%) were either not affected or rarely affected, respectively; 26.4% of the students answered that they were sometimes affected; 20.9% of the students responded that they were affected *most of the time* and only 4.4% answered that they were affected *all the time* (see Table 4).

Table 4: Frequency of questions related to environmental factors.

Question	Never		Seldom		Sometimes		Most of the time		All the time	
	f	%	f	%	f	%	f	%	f	%
Categorisation	12	13.2	15	16.5	27	29.7	24	26.4	13	14.3
Ranking	19	20.9	15	16.5	28	30.8	16	17.6	13	14.3
Covid-19 effects	1	1.1	3	3.3	16	17.6	31	34.1	40	44.0
Covid-19 affected	21	23.1	23	25.3	24	26.4	19	20.9	4	4.4

Academic Factors

Since this survey was conducted in the context of the Covid-19 pandemic, the researcher wanted to analyse how the teaching commitment factor influenced student dropout. Indeed, with the new modality, in which there are two types of classes - asynchronous and synchronous - the role of the teacher has also undergone significant changes to achieve results. Commitment is a crucial aspect of this role that is valued considerably by the students. When students were asked about teaching commitment's influence on student dropout, 16.5% of the students answered *all the time* and 41.8% answered *most of the time*. Related to *teachers do not enhance*, as a determinant of student dropout, approximately 56.1% of the participants assigned a score greater than or equal to four for this item.

The results of the present study suggest that conflicts that may arise between teachers and students may influence desertion: in fact, approximately 53.9% of the participants assigned a score greater than or equal to four for this item. Furthermore, regarding the adaptation of the students to the methodology used, 58.3% of the participants assigned a value greater than or equal to four (see Table 5).

Table 5: Frequency of questions related to academic factors.

Question	Never		Seldom		Sometimes		Most of the time		All the time	
	f	%	f	%	f	%	f	%	f	%
Teacher commitment	3	3.3	7	7.7	28	30.8	38	41.8	15	16.5
Teachers do not enhance	3	3.3	11	12.1	26	28.6	32	35.2	19	20.9
Conflicts between teachers and students	5	5.5	12	13.2	25	27.5	34	37.4	15	16.5
Methodology adaptation	2	2.2	10	11.0	26	28.6	32	35.2	21	23.1

Personal Factors

In response to the question about low expectations of their career influencing university dropout, 28.6% of the students answered *all the time*, and 40.7% believed that low expectations concerns were influential *most of the time*. Another aspect highlighted in the literature is cases whereby the recommendation of the parents conditions the decision to choose a professional career: in this case, many students start the career and then abandon it a few semesters later, in some cases to pursue another career, in others to move away from the university. The results show that 77.0% of the participants assigned a value equal to or greater than four to this item.

In response to the question: *unplanned pregnancy influences university dropout*, 66.0% of the participants assigned a value equal to or greater than four to this item. In response to the question: *lack or loss of family support to continue the studies influences university dropout*, 34.1% of the students answered *all the time* and 14.3% answered *most of the time*.

In general, in contrast to the factors mentioned above, high percentages were observed among participants' responses. These results are in line with those studies on dropout rates that predominately consider personal aspects and their influence on student dropout. Factors related to the integration of the student into the university environment have been reported as determinants of university dropout. A similar situation was found for the lack of student integration, whereby 48.4% assigned a value greater than or equal to four. Table 6 shows the results of the items corresponding to personal factors.

Table 6: Frequency of questions related to personal factors.

Question	Never		Seldom		Sometimes		Most of the time		All the time	
	f	%	f	%	f	%	f	%	f	%
Expectations	2	2.2	4	4.4	22	24.2	37	40.7	26	28.6
Parents' recommendations	2	2.2	5	5.5	14	15.4	32	35.2	38	41.8
Unplanned pregnancy	4	4.4	5	5.5	22	24.2	29	31.9	31	34.1
Lack of family support	1	1.1	5	5.5	24	26.4	30	33.0	31	34.1
Lack of integration	5	5.5	11	12.1	31	34.1	31	34.1	13	14.3

Economic Factors

Economic issues have been considered as a determinant of student dropout [22]. Some students need to work to support the family's livelihood. In response to the question: *economic commitment to the family influences university dropout*, 36.3% of the students answered *most of the time* and 37.4% believed that economic commitment concerns were influential *all the time*. In response to the question: *programme price compared to others influences university dropout*, 44.0% of the students answered *most of the time*, while 28.6% answered *all the time*. While 31.9% of the students answered that financial support influences university dropout, 40.7% believed financial concerns were influential *most of the time*. The impossibility of paying tuitions fees is considered a determinant of student dropout. In fact, 82.4% of the participants assigned a value greater than or equal to four (see Table 7).

Table 7: Frequency of questions related to economic factors.

Question	Never		Seldom		Sometimes		Most of the time		All the time	
	f	%	f	%	f	%	f	%	f	%
Economic commitment	2	2.2	4	4.4	18	19.8	33	36.3	34	37.4
Programme price	1	1.1	2	2.2	22	24.2	40	44.0	26	28.6
Financial support	0	0	2	2.2	23	25.3	37	40.7	29	31.9
Tuition payments	2	2.2	0	0	14	15.4	26	28.6	49	53.8

Organisational Factors

Organisational issues have been considered as a determinant of student dropout. In response to the question: *university location influences university dropout*, 26.4% of the students answered *most of the time* and 15.4% believed that university location concerns were influential *all the time*. In response to the question: *awarding of scholarships influences university dropout*, 28.6% of the students answered *most of the time* and 23.1% believed that awarding of scholarships concerns were influential *all the time*. Research activity is inherent to both teachers and students. When students were asked if the research culture influences student dropout, 20.9% of students answered *all the time* and 26.4% *most of the time*. Table 8 shows the results of the items corresponding to organisational factors.

Table 8: Frequency of questions related to organisational factors.

Question	Never		Seldom		Sometimes		Most of the time		All the time	
	f	%	f	%	f	%	f	%	f	%
University location	5	5.5	16	17.6	32	35.2	24	26.4	14	15.4
Awarding of scholarships	4	4.4	8	8.8	32	35.2	26	28.6	21	23.1
Research culture	3	3.3	15	16.5	30	33.0	24	26.4	19	20.9

Student Dropout

Fifty-six percent of the respondents are interested in continuing and completing their studies, while 27.5% responded that they were interested *most of the time* and 16.5% demonstrated interest on a regular basis.

DISCUSSION

The use of information technology, especially the Internet, has been recognised by several authors as a strategic ally of organisations to support their operations and provide better services and products to customers or citizens in the case of public organisations. Technology also enriches the educational experience by providing unlimited learning options that guide the student [26]. However, students' inappropriate use of information technology can lead to unfavourable outcomes, such as distracting students. In other cases, students misuse the technology and remain in front of the computer for hours doing useless things [26].

Students consider in 59.4% that addiction to use the Internet without academic purpose influences student dropout, while 56.1% agreed that inappropriate use of the Internet and addiction to networks could condition student dropout. Although information technology is a strategic component facilitating teaching and learning, the present findings suggest that its inefficient use is a cause of student dropout. In the current context of Covid-19, moreover, social networks have allowed students to communicate with their families long distance and have become a valuable tool to coordinate academic work. Meanwhile, 58.3% of the students surveyed noted that limited knowledge of technology (i.e. a lack of digital skills) could cause student dropout.

In recent years, university categorisation and rankings have become an indicator appreciated by prospective students. The results confirm it, in fact 40.7% of the students assigned a score greater than or equal to four for categorisation and 31.9% for ranking as factors influential in student dropout. The university education was impacted by Covid-19, which increased student dropout rates and posed new challenges [27]. Covid-19 emergency caused universities to close their doors to avoid further contagion among students, teachers and administrative staff. The findings show that 78.1% of the students considered the Covid-19 effects as influential toward university dropout. The university centres have been forced to establish strategies to avoid spreading the virus via students' face-to-face attendance and opted for semi-presential classes.

This change involved a series of requirements to be met by students, teachers, administrators, the organisation and its environment more generally. As the crisis worsened, universities had to implement classes using existing platforms, such as Zoom, Google Meet, Google Classroom and Microsoft Teams, among others. It was not the new technology alone that caused problems as students faced the additional problem of having the necessary infrastructure, such as acquiring a computer, which in some cases was unfeasible. The same was true for teachers, who had to have the infrastructure to teach their classes. There was also the issue of the digital competencies of teachers, students and other university staff members. At the organisational level, processes have had to be modified to provide on-line services instead of face-to-face ones. Nevertheless, a low percentage of students expressed the belief that Covid-19

affected their studies (25.3%). This low percentage can be explained because in this period teachers have had to provide the necessary material for their learning using different mechanisms [28].

The results show that the participants consider important the commitment of teachers in the teaching-learning process and its influence on student dropout, in fact, 58.3% of the students assigned a score greater than or equal to four. Also, the students consider that if teachers do not enhance vocational training and vocational guidance, it may influence the decision to leave university (20.9%). More than 50% of the students surveyed considered conflicts between teachers and students as leading both to dropout rates and to reduced student integration. Several studies have shown that students often have difficulties in the first year of studies [7], and even in later years, students have challenges with organising their curricular and extracurricular activities [15].

Scholars have posited personal factors as aspects conditioning student dropout since reconciling professional, familial and academic activities can occur for students who work or have a family. The students consider that the low expectation of the career in the future is considered a determinant for student dropout. In addition, 77% of the students regarded parental recommendations to pursue a professional career as a factor influencing dropout. Vocational factor has been considered as the most relevant factor that affect university dropout [22]. Unplanned pregnancy is another factor discussed in the literature; in this case, 66% of the students suggested that it affects dropout. Loss of financial support from a family member was considered by 67.1% of the students to influence student desertion. This result reflects the reality of students, especially those at private universities, who had to stop studying because they were deprived of the support of parents who lost their jobs or who became ill and, in some cases, lost their lives to Covid-19. Factors related to a student's integration into the university environment have been reported as influencing university dropout. For instance, low levels of autonomy and resilience increase difficulties in academic life [1], while students with higher levels of personal resilience are better prepared for adversity.

The process of choosing a university career is complex and involves, for example, exploring and evaluating different programmes, reflecting on each of them and finally selecting the programme of interest. However, in some cases, this selection may be influenced by other people during their secondary school [29] or by parents or relatives and not by the student themselves, thus leading to strong possibilities of later abandoning the studies. In the case of private universities, the impossibility of paying tuition fees influences university dropout. Indeed, the results show that 82.4% of the students consider this an influential factor in dropping out. In 2020, in response to the situation whereby students unable to pay their tuitions chose to drop out of their studies, many universities provided facilities to their students to allow them to continue their studies. Economic factor is considered relevant because it affects university dropout [22].

Many students transfer from different locations to the university, and it can be a reason for dropout. In this study it was found that 41.8% of the participants considered this factor. That a university not has student support scholarships can be a reason for abandoning studies. Research is part of academic life and it is important for the university to foster a culture of research, in this regard, 20.9% confirm this. Regarding student dropout, 48.4% of the participants responded that they were sure they were not planning to leave their studies and 56% were confident they would complete their studies. Given these percentages, therefore, it is crucial for the organisation to establish strategies to retain these students. Furthermore, identifying the conditioning factors is essential for those in charge of academic organisations to allow them to develop strategies to reduce the rate of student dropout. For that reason, it is important that universities maintain detailed record about student dropout and determine a prediction model of student dropout. This research presents some limitations and future developments. Future studies should increase the sample and include other universities. It may also be valuable to develop and conduct in-depth interviews with students who have dropped out, analysed under a quantitative approach.

CONCLUSIONS

Student dropout is a problem affecting universities both nationally and internationally. This research builds upon several existing studies on dropout to analyse the issue from the perspective of the students. In the wake of the Covid-19 pandemic, student dropout has become a concern for the government, universities, teachers, students and parents. The literature has suggested various personal factors, programme-related factors, teacher integration factors, environmental factors, academic factors, family factors, economic factors and motivational factors, among others, as potential determinants of student dropout. Today, technological factors - and the deployment of technological competencies - have emerged as a new influential category in the context of Covid-19, which has affected both teachers and students. This descriptive, cross-sectional research employed a quantitative approach.

A total of 91 students from a public university participated in a 36-item survey via Google Forms with the purpose of determining their perceptions. The results show that with regard to technological aspects, the misuse of the Internet for non-academic purposes may be a cause of dropout. Moreover, in 2020, many students' families were affected by the Covid-19 pandemic. Students indicated that the subsequent loss of support from family members in charge of their studies could be a cause of dropout, as well as the loss of close family members. In the academic field, the author has had to give emotional support to students who, faced with sick fathers and mothers, fell into depression and were on the verge of dropping out of college. However, notably, the students surveyed did not suggest that Covid-19 would affect their studies, nor were the changes faced, such as the shift from face-to-face to virtual classes, perceived as a cause of desertion. Results show that according to the students' perceptions, aspects influencing student dropout include tuition

payment, effects of Covid-19, parents' recommendation to pursue a professional career, economic commitment, unplanned pregnancy and the loss of financial support from a family member. The results show that the economic and personal factors obtained the highest percentages with values equal to or greater than four, a result that coincides with the frequency with which these factors are mentioned in the literature. In future work, factor analysis will be used to demonstrate whether these factors condition student desertion according to the students' perception.

REFERENCES

1. Casanova, J.R., Gomes, C.M., Bernardo, A.B., Núñez, J.C. and Almeida, L.S., Dimensionality and reliability of a screening instrument for students at-risk of dropping out from higher education. *Studies in Educational Evaluation*, 68 (2021).
2. Maldonado, S., Miranda, J., Olaya, D., Vásquez, J. and Verbeke, W., Redefining profit metrics for boosting student retention in higher education. *Decision Support Systems*, 143 (2021).
3. Tinto, V., Through the eyes of students. *J. of College Student Retention: Research, Theory and Prac.*, **19**, 254-269 (2017).
4. Ashour, S., Analysis of the attrition phenomenon through the lens of university dropouts in the United Arab Emirates. *J. of Applied Research in Higher Educ.*, **12**, 357-374 (2020).
5. Dos Santos de Assis, B., Ogasawara, E., Barbastefano, R. and Carvalho, D., Frequent pattern mining augmented by social network parameters for measuring graduation and dropout time factors: a case study on a production engineering course. *Socio-Economic Planning Sciences*, 101200 (2021).
6. Rivera, C., Baik, C. and Lodge, J., Teacher and student interactions in the first year of university. *J. of Further and Higher Educ.*, **44**, 1130-1142 (2020).
7. Blair, A., Understanding First-year students' transition to university: a pilot study with implications for student engagement, assessment, and feedback. *Politics*, **37,** 215-228 (2017).
8. Khanyisa, J., Jadhav, A. and Ajoodha, R.A., Review: predicting student success at various levels of their learning journey in a science programme. *Proc. 2021 IEEE Inter. IOT, Electronics and Mechatronics Conf.*, 1-5 (2021).
9. Bussu, A., Detotto, C. and Serra, L., Indicators to prevent university drop-out and delayed graduation: an Italian case. *J. of Applied Research in Higher Educ.*, **12**, 230-249 (2020).
10. Acevedo, F., Concepts and measurement of dropout in higher education: a critical perspective from Latin America. *Issues in Educational Research*, **31**, 661-678 (2021).
11. Vásquez, J. and Miranda, J., *Data Science and Digital Business*. Springer International Publishing (2019).
12. Tinto, V., Dropout from higher education: a theoretical synthesis of recent research. *Review of Educational Research*, **45,** 89-125 (1975).
13. Munizaga, F., Cifuentes, M. and Beltrán, A., Student retention and dropout in higher education in Latin America and the Caribbean: a systematic review. *Education Policy Analysis Archives*, **26**, 1-32 (2018).
14. Kim, D. and Kim, S., Sustainable education: analyzing the determinantsof university student dropout by nonlinear paneldata models. *Sustainability*, **10**, 1-18 (2018).
15. Kori, K., Pedaste, M., Tõnisson, E., Palts, T., Altin, H., Rantsus, R., Sell, R., Murtazin, K. and Rüütmann, T., First-year dropout in ICT studies. *IEEE Global Engng. Educ. Conf.*, 437-445 (2015).
16. Ribeiro, R. and Canedo, E., *School Dropout Prediction: a Case Study*. Latifi, S. (Ed), Springer, 211-217 (2011).
17. Ahmed, S.A. and Khan, S.I., A machine learning approach to predict the engineering students at risk of dropout and factors behind: Bangladesh perspective. *Proc. 2019 10th Inter. Conf. on Computing, Communic. and Networking Technologies*, 1-6 (2019).
18. Aina, C., Baici, E., Casalone, G. and Pastore, F., The Determinants of university dropout: a review of the socio-economic literature. *Socio-Economic Planning Sciences*, **79**, 1-16 (2022).
19. Ambiel, R.A., Cortez, P.A. and Salvador, A.P., Predição da potencial evasão acadêmica entre estudantes trabalhadores e não trabalhadores. *Psicologia: Teoria e Pesquisa*, **37**, 1-10 (2021) (in Spanish).
20. Chopra, A. and Menon, S., Is job shadowing a panacea for educational drop outs? *Lecture Notes in Networks and Systems*, *194 LNNS*, 1975-1987 (2021).
21. Rincón, A., Barragán, S. and Vitery, F., Rurality and dropout in virtual higher education programmes in Colombia. *Sustainability*, 13 (2021).
22. Rodríguez-Pineda, M. and Zamora-Araya, J., College student dropout: cohort study about possible causes. *Uniciencia*, **35**, 19-37 (2021).
23. Sandoval-Palis, I., Naranjo, D., Vidal, J. and Gilar-Corbi, R., Early dropout prediction model: a case study of university leveling course students. *Sustainability*, **12**, 1-17 (2021).
24. Mabel, Z. and Britton, T.A., Leaving late: understanding the extent and predictors of college late departure. *Social Science Research*, **69**, 34-51 (2018).
25. Alban, M., Contribuciones a La Predicción de La Deserción Universitaria a Través de Minería de Datos, UNMSM (2019) (in Spanish).
26. Shatri, Z.G., Advantages and disadvantages of using information technology in learning process of students. *J. of Turkish Science Educ.*, **17**, 420-428 (2020).
27. Chong, Y. and Soo, H., Evaluation of first-year university students' engagement to enhance student development. *Asian J. of University Educ.*, **17**, 113-121 (2021).
28. Azhar, N.C. and Napitupulu, T.A., Factors affecting the effectiveness of on-line learning in higher education. *World Trans. on Engng. and Technol. Educ.*, 20, **1**, 60-65 (2021).
29. Dos Santos, L.M., Female engineering students' experiences and career decisions: a case study in a regional Australian university. *World Trans. on Engng. and Technol. Educ.*, 19, **2**, 226-231 (2021).